

Appl. No.: 10/698,502  
Amtd. Dated: July 5, 2005  
Reply to Office Action of: April 4, 2005

### REMARKS/ARGUMENTS

#### **1. Time filing of this Response**

This paper is submitted in response to the Office action of April 4, 2005. The 3-month date for a response expires on July 4, 2005, which is a National Holiday. Under 37 CFR §1.6 and 1.7(a), when a period of time set by an Office Action expires on a Saturday, Sunday or Federal Holiday, the action may be taken on the next succeeding business day. This Response is being filed on July 5, 2005 as attested by the signatures and dated hereon.

#### **2. Claims**

In view of the above amendments and the following remarks, favorable reconsideration of the outstanding office action is respectfully requested.

Claims 24 - 40 remain in this application. No claims have been amended or cancelled. No new claims have been added.

#### **3. Drawings**

The Examiner has not indicated in the accompanying form PTO-948 that the formal drawings previously submitted have been approved. However, without specific rejection from the Examiner, Applicants will understand they have been approved.

#### **2. § 102 and 103 Rejections**

The Examiner has rejected claims 24 - 40 under 35 U.S.C. § 102(b) as being anticipated by or in the alternative, under 35 U.S.C. 103(a) as obvious over JP35719192A (Yamazaki et al). Applicant traverses the rejections.

The present invention describes a method of making optical quality alkaline earth metal fluoride single crystals grown as disks in a graphite crucible having permeability greater than 4 cm<sup>2</sup>/s as measured according to DIN 51935. As indicated in applicant's Table 1, porosity and permeability are not the same measure. In Table 1 the Type b and C carbons have approximately the same porosity (B = 16.1% and C = 16.7%), but they

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have such different permeabilities (B = 2.6 and C = 4.6). As applicant indicates in Paragraph [0070], while lead (Pb) is found in a single crystal made using the Type B carbon crucible, no lead is found in a single crystal made using the Type C carbon crucible.

The purpose for using a permeable crucible such as a Type C carbon crucible is to permit the discharge of impurities from metal fluoride melt so that they are not included in the single crystal when it is formed. As taught by applicant's specification the quality of the resulting alkaline earth metal fluoride single crystal will be improved by volatilization through the walls of the permeable crucible. The impurity of primary interest is volatile lead oxide (PbO) that is formed by a reaction between any alkaline earth metal oxide (e.g., CaO) that may be present and an oxide scavenger such as PbF<sub>2</sub>. (See specification, Paragraphs [0014] and [0041]).

In contrast to the claimed invention, Yamazaki et al teach the use of quartz crucible having a carbon liner of porosity in the range of 5-30% and pore diameters of  $\leq 2$  mm. Yamazaki et al does not specify the permeability of the graphite liner. Applicant submits that it is the permeability that is the critical factor and Yamazaki et al do not teach the permeability needed to grow alkaline earth metal fluoride single crystals suitable for below 200 nm optical lithography.

In contrast to Yamazaki et al., applicant specifically teaches the use of crucibles having a *permeability* greater than 4 cm<sup>2</sup>/s. Permeability is the key factor. Again referring to applicant's Table 1, it is clear that not only does porosity not correlate to permeability, but pore size also does not correlate to applicant's teaching concerning permeability. For example, in Table 1 the Type A carbon has an average pore size of 2.2  $\mu$ m. While this is less than Yamazaki et al's teaching of a pore size  $\leq 2$  mm, the metal fluoride single crystal formed using the Type A crucible had a lead content in the range of 1,000 - 1,500 ppm, which is completely unacceptable. It should also be noted that the Type A carbon crucible had a porosity of 15.8% and a permeability of 0.13 cm<sup>2</sup>/s. Referring to the Type B carbon crucible of applicant's Table 1, this crucible has a porosity of 16.1% and an average pore size of 19.1  $\mu$ m. The Type B crucible

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produces an alkaline earth metal fluoride single crystal having a lead content in the range or 5-20 ppm; an unacceptable level. It is only when one uses a crucible having a permeability greater than 4 cm<sup>2</sup>/s, for example, the Type c and D crucibles of applicants Table 1, can one make an alkaline earth metal fluoride single crystal having a sub-ppm level of lead in the crystal.

Applicant also notes that Yamazaki et al do not teach or suggest the use of a graphite or carbon crucible without the use of a quartz outer crucible. The use of the quartz outer vessel would inhibit the removal of impurities, thus increasing the contamination of any metal fluoride single crystal that is grown. As applicant notes from the papers provided by the Examiner, Yamazaki et al teach "pulling" a crystal by what is essentially the Czochralski technique. This is a completely different technique than is described in the present application.

Therefore, applicant respectfully submits in view of the foregoing facts and arguments, the present invention as claimed is neither anticipated under §102(b), nor taught or suggested under §103(a) in view of Yamazaki et al. Applicant further submits that is thus proper for the Examiner to withdraw the rejection of the pending claims 24-40.

Based upon the above amendments, remarks, and papers of records, applicant believes the pending claims of the above-captioned application are in allowable form and patentable over the prior art of record. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Applicant believes that no extension of time is necessary to make this Reply timely. Should applicant be in error, applicant respectfully requests that the Office grant such time extension pursuant to 37 C.F.R. § 1.136(a) as necessary to make this Reply timely, and hereby authorizes the Office to charge any necessary fee or surcharge with respect to said time extension to the deposit account of the undersigned firm of attorneys, Deposit Account 03-3325.

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Please direct any questions or comments to Walter M. Douglas at (607) 974-2431.

5 July 2005

Date

**CERTIFICATE OF TRANSMISSION  
UNDER 37 C.F.R. 81.8**

I hereby certify that this paper and any papers referred to herein are being transmitted by facsimile to the U.S. Patent and Trademark Office at 703-872-9306 on:

5 July 2005

Date

Walter M. Douglas

Date

Respectfully submitted,  
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